

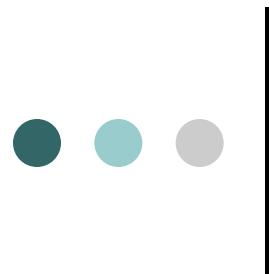
Light Rail Economic Impact Analysis

Summary of Findings from Task 1 of MAG Contract 382

**Aaron Golub, Subhrajit Guhathakurta
and Bharath Sollapuram**

**School of Geographical Sciences and Urban Planning
Arizona State University**

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Project Overview

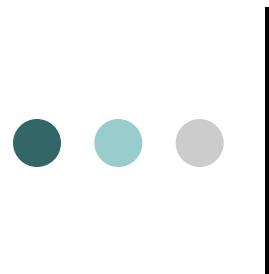
- Goals: to understand the impact of the LRT announcement, planning, construction, and operation on real-estate values of properties nearby
- Approach: Statistical analysis using actual real-estate transaction prices for nearby properties
- Findings: Significant price impacts for residential, multi-family residential, vacant land, and commercial properties
 - Impacts from proximity in space
 - Impacts from the time-phase of the project



Methodology

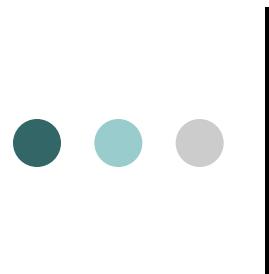
○ Hedonic Regression

- $P_{i,t} = f(I, L, T, t)$
 - $P_{i,t}$ = price of parcel/property (i) at time (t)
 - I = Structural characteristics of the parcel/property
 - L = location of the parcel
 - T = time period
 - t = time



Data

1. Phoenix LRT station locations and track line
2. Phoenix LRT construction timeline information
3. Street network data
4. Downtown and airport location points
5. TOD parcels information
6. W.P. Carey Repeat Sales Index
7. 2010 GIS parcel information
8. W.P. Carey Repeat Sales Database
9. Assessors Premium Master Book 100 database



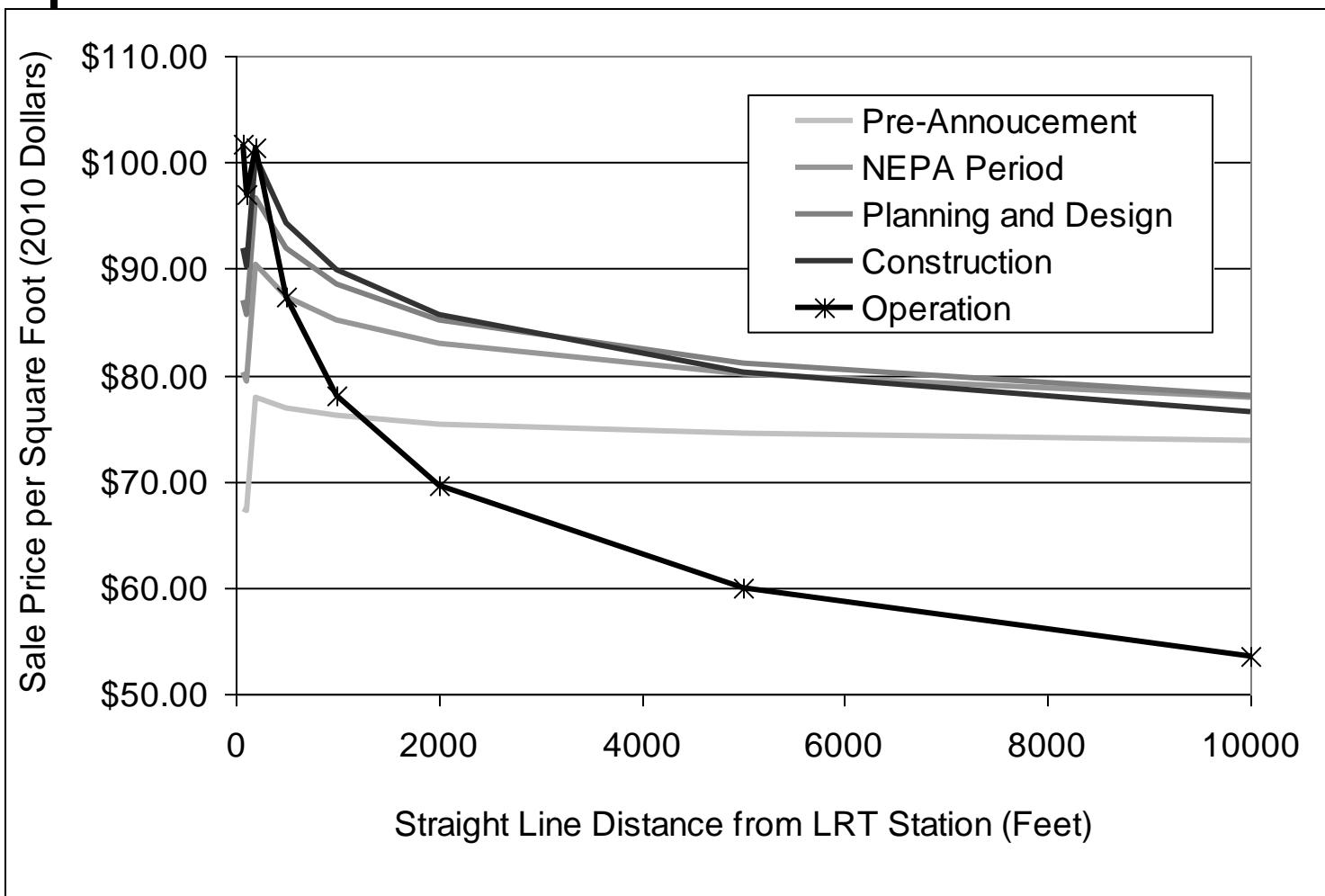
Analysis

- Separate regression analysis for each type of property
 - Single-Family Homes
 - Condominiums
 - Commercial properties
 - Vacant parcels
- Regression design
 - Structural
 - Temporal
 - Locational
 - “Interaction” Terms

Single-Family Homes – Double-Log Regression Results

Variable Name	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig.
	B	S.E.	Beta		
(Constant)	4.41743	0.056		78.819	0.000
Log_Livingsqft	0.76051	0.006	0.48287	133.175	0.000
Log_LotSqft	0.11243	0.002	0.16675	55.279	0.000
Age_Bldg	-0.00113	0.000	-0.03820	-12.346	0.000
Patios	0.01747	0.001	0.03122	12.652	0.000
Bath_Fixt	0.04006	0.001	0.15355	42.814	0.000
Floor	0.19129	0.010	0.04929	19.762	0.000
Dummy_Pool	0.13226	0.004	0.08085	33.033	0.000
Dummy_NEPA	0.27711	0.048	0.21928	5.768	0.000
Dummy_PD	0.42989	0.057	0.28072	7.486	0.000
Dummy_Const	0.55127	0.051	0.42326	10.915	0.000
Dummy_Operat	1.05609	0.071	0.55136	14.814	0.000
Dummy_TOD	0.06558	0.035	0.00443	1.884	0.060
Log_StdistST	-0.01390	0.003	-0.01549	-4.122	0.000
Dummy_Tr	-0.15746	0.068	-0.00982	-2.314	0.021
Log_StdistCBD	-0.11926	0.002	-0.12660	-48.214	0.000
Log_StdistAirport	0.09809	0.003	0.08085	30.294	0.000
Int_DSt_NEPA	-0.02406	0.006	-0.16415	-4.318	0.000
Int_DSt_PD	-0.04049	0.007	-0.22800	-6.080	0.000
Int_DSt_Const	-0.05583	0.006	-0.36990	-9.536	0.000
Int_DSt_Operat	-0.14944	0.008	-0.67361	-18.097	0.000
Int_DTr_NEPA	-0.02342	0.099	-0.00075	-0.236	0.813 ^I
Int_DTr_PD	0.00616	0.127	0.00013	0.049	0.961 ^I
Int_DTr_Const	0.02885	0.103	0.00086	0.280	0.779 ^I
Int_DTr_Operat	-0.00646	0.142	-0.00012	-0.045	0.964 ^I

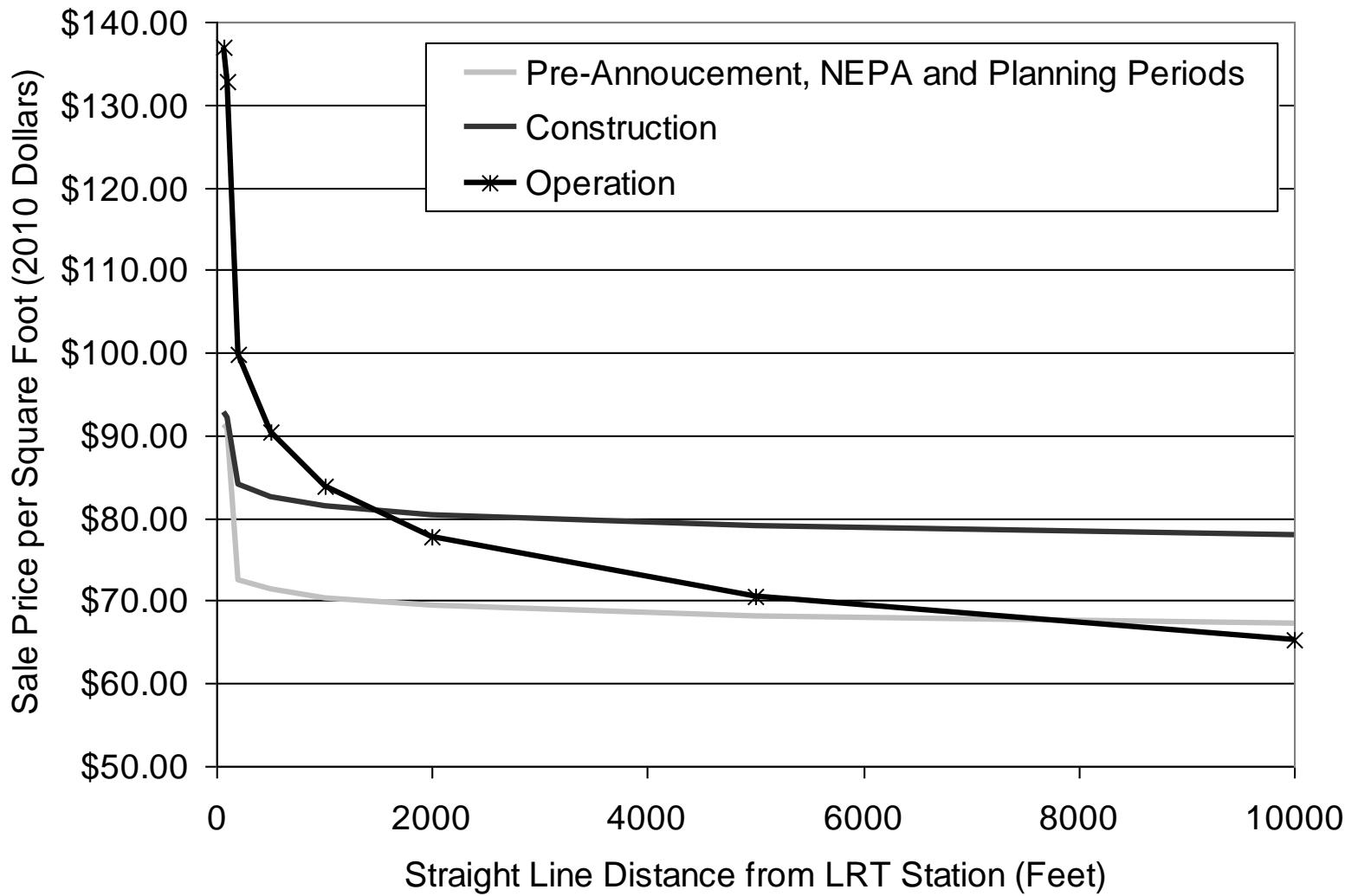
Distance to LRT Impacts on Single-Family Homes



Condominium– Double-Log Regression Results

Variable Name	Unstandardized Coefficients			Standardized Coefficients	t-value	Sig.
	B	S.E.	Beta			
(Constant)	5.61166	0.115			48.948	0.000
Log_Livingsqft	0.92383	0.012	0.49961		77.911	0.000
Age_Bldg	-0.01525	0.000	-0.34160		-67.763	0.000
Patios	0.07288	0.004	0.07586		16.572	0.000
Bath_Fixt	0.01682	0.002	0.05909		9.018	0.000
Dummy_Pool	0.34004	0.044	0.03270		7.735	0.000
Dummy_NEPA	0.02173	0.094	0.01528		0.231	0.817
Dummy_PD	0.13596	0.106	0.07940		1.278	0.201
Dummy_Const	0.14780	0.076	0.13386		1.951	0.051
Dummy_Operat	0.78899	0.112	0.36923		7.026	0.000
Dummy_TOD	-0.04717	0.033	-0.00610		-1.411	0.158
Log_StdistST	-0.01976	0.008	-0.02781		-2.615	0.009
Dummy_Tr	0.20937	0.062	0.05095		3.377	0.001
Log_StdistCBD	-0.17294	0.004	-0.21256		-38.848	0.000
Log_StdistAirport	0.06062	0.007	0.04061		8.325	0.000
Int_DSt_NEPA	0.00567	0.011	0.03372		0.511	0.609
Int_DSt_PD	0.00240	0.013	0.01176		0.190	0.849
Int_DSt_Const	0.00692	0.009	0.05220		0.771	0.441
Int_DSt_Operat	-0.08873	0.013	-0.34006		-6.581	0.000
Int_DTr_NEPA	0.13190	0.087	0.00959		1.512	0.131
Int_DTr_PD	0.14566	0.120	0.00627		1.211	0.226
Int_DTr_Const	-0.13124	0.067	-0.02558		-1.964	0.050
Int_DTr_Operat	-0.01991	0.080	-0.00193		-0.249	0.804

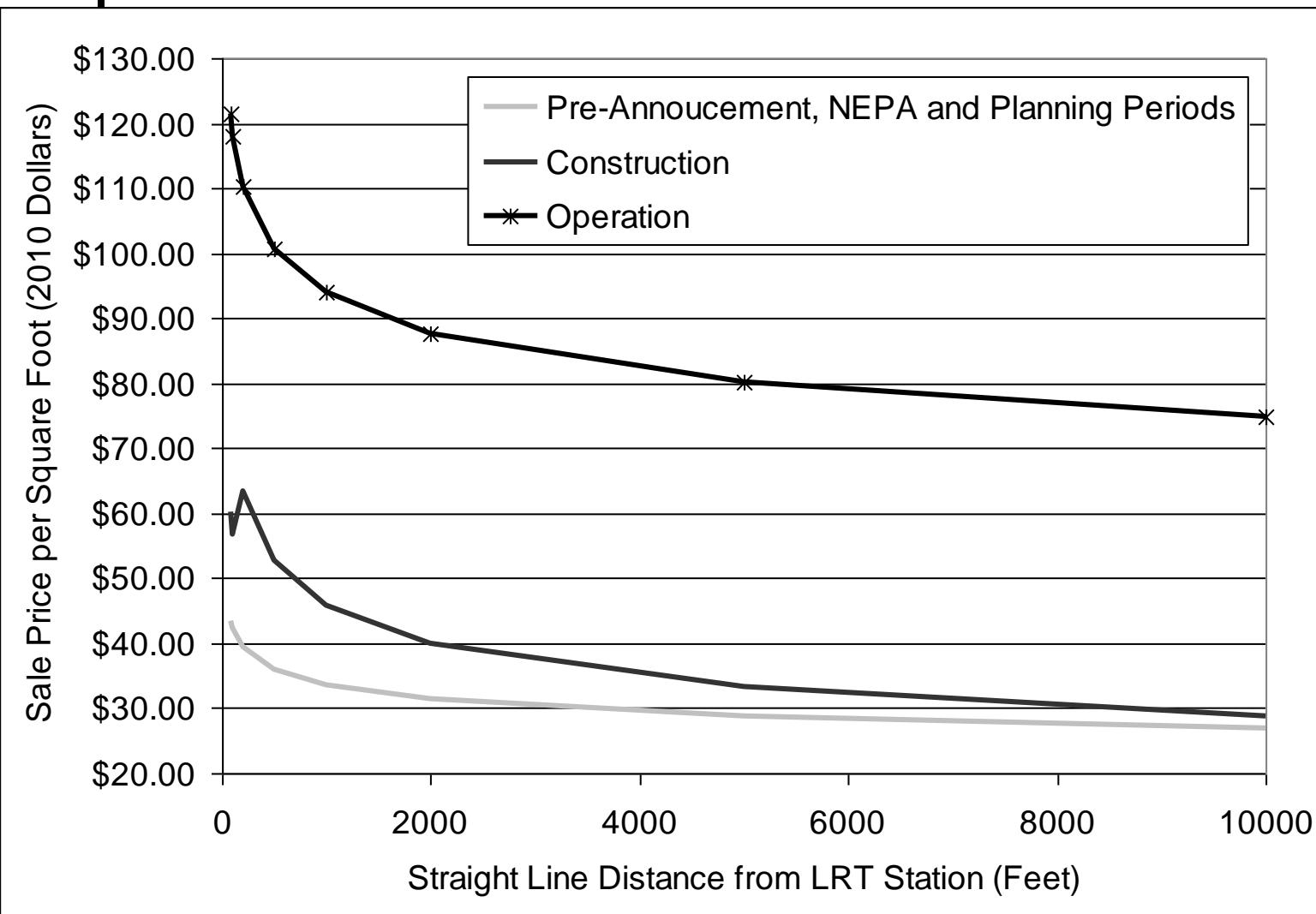
Distance to LRT Impacts on Condominiums



Commercial Properties – Double-Log Regression Results

Variable Name	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig.
	B	S.E.	Beta		
(Constant)	5.05874	0.272		18.565	0.000
Log_Livingsqft	0.53491	0.010	0.56391	53.139	0.000
Log_Lotsqft	0.28698	0.011	0.27563	25.842	0.000
Age_Bldg	-0.01016	0.000	-0.16673	-21.428	0.000
Floor	0.36767	0.114	0.02309	3.230	0.001
Dummy_NEPA	0.24689	0.259	0.08713	0.952	0.341
Dummy_PD	0.32572	0.286	0.09960	1.137	0.255
Dummy_Const	1.01160	0.265	0.37346	3.820	0.000
Dummy_Operat	1.02621	0.478	0.18098	2.145	0.032
Dummy_TOD	0.04672	0.059	0.00696	0.792	0.428
Log_StdistST	-0.09910	0.017	-0.06747	-5.668	0.000
Dummy_Tr	0.00015	0.086	0.00002	0.002	0.999
Log_StdistCBD	-0.03744	0.014	-0.02011	-2.723	0.006
Log_StdistAirport	0.09594	0.016	0.04353	6.016	0.000
Int_DSt_NEPA	-0.01848	0.031	-0.05512	-0.605	0.545
Int_DSt_PD	-0.02176	0.034	-0.05604	-0.644	0.520
Int_DSt_Const	-0.10170	0.031	-0.31699	-3.277	0.001
Int_DSt_Operat	-0.07609	0.056	-0.11318	-1.350	0.177
Int_DTr_NEPA	-0.20115	0.140	-0.01368	-1.435	0.151
Int_DTr_PD	0.05571	0.183	0.00256	0.304	0.761
Int_DTr_Const	-0.24943	0.132	-0.01890	-1.884	0.060
Int_DTr_Operat	-0.14562	0.238	-0.00489	-0.612	0.540

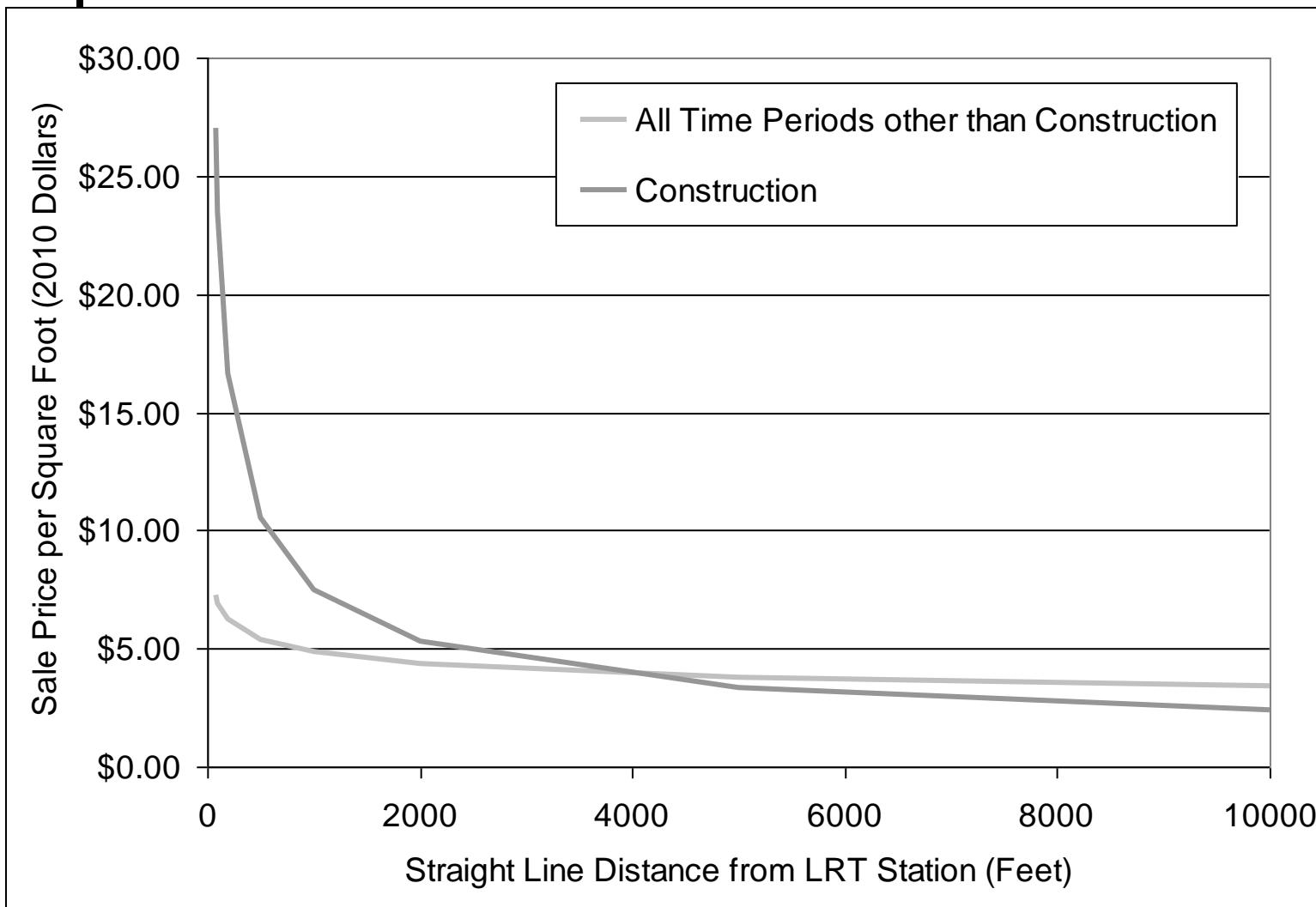
Distance to LRT Impacts on Commercial Properties

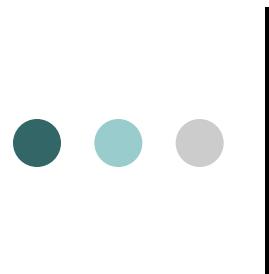


Vacant Parcels – Double-Log Regression Results

Variable Name	Unstandardized Coefficients		Beta	t-value	Sig.
	B	S.E.			
(Constant)	1.99935	0.652		3.067	0.002
Log_Lotsqft	0.96132	0.024	0.70792	40.473	0.000
Dummy_NEPA	-0.72823	0.777	-0.20684	-0.938	0.348
Dummy_PD	1.00665	0.904	0.25680	1.114	0.266
Dummy_Const	2.78781	0.722	0.87202	3.859	0.000
Dummy_Operat	-3.30863	1.759	-0.35338	-1.881	0.060
Dummy_TOD	0.44330	0.177	0.04846	2.507	0.012
Log_StdistST	-0.15508	0.053	-0.08103	-2.902	0.004
Dummy_Tr	0.28482	0.208	0.03509	1.371	0.171
Log_StdistCBD	-0.06773	0.040	-0.03131	-1.691	0.091
Log_StdistAirport	0.18070	0.047	0.06524	3.815	0.000
Int_DSt_NEPA	0.07120	0.092	0.17121	0.774	0.439
Int_DSt_PD	-0.14510	0.107	-0.31043	-1.352	0.176
Int_DSt_Const	-0.34077	0.086	-0.88627	-3.954	0.000
Int_DSt_Operat	0.38929	0.210	0.34626	1.857	0.064
Int_DTr_NEPA	0.30705	0.430	0.01368	0.714	0.475
Int_DTr_PD	-0.42938	0.421	-0.02045	-1.019	0.308
Int_DTr_Const	-0.39976	0.345	-0.02514	-1.158	0.247
Int_DTr_Operat	0.35730	1.070	0.00603	0.334	0.738

Distance to LRT Impacts on Vacant Parcels





Impact of TOD designation

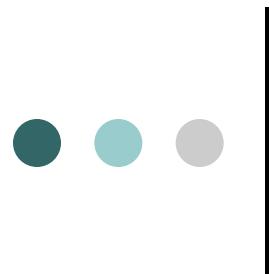
- Only Vacant Parcels showed a significant (at 95% C.I.) relationship between TOD and prices
 - 56% impact
- Single-Family sales were almost significant (94.xx % C.I.)
 - 6.8% impact



Questions....

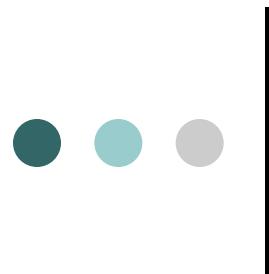


Appendix Slides



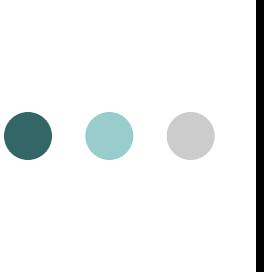
Final combined database

- Sale date
- Price (adjusted by W.P.C. housing price index)
- Maricopa Co. parcel identity
- Parcel address
- Lot, interior size
- Age
- Pool, patios, baths, etc.
- Distances to CBD, Sky Harbor, LRT (tracks and stations)
- Time period of sale
- TOD designation



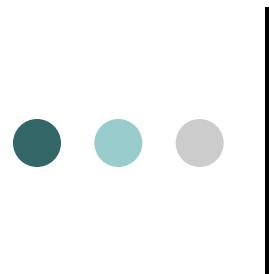
Structural Variables

- Living square footage (Living_Sqft)
- Lot footage (Lot_Sqft)
- Age of the property (Age_Bldg)
- Patios (Patios)
- Bath Fixtures (Bath_Fixt)
- Number of Floors (Floor)
- Pool (Dummy_Pool)



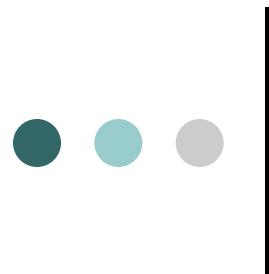
Temporal Variables

Pre-NEPA phase (Dummy_PreNEPA)	Sales before NEPA process was initiated (before 3/1/1999)
NEPA review phase (Dummy_NEPA)	Sales during MIS/NEPA process (between 3/1/1999 and 1/24/2003)
Project planning and design phase (Dummy_PD)	Sales during project planning, design and engineering process (between 1/25/2003 and 2/15/2005)
Construction phase (Dummy_Const)	Sales during construction process (between 2/15/2005 and 12/26/2008)
Operation phase (Dummy_Operat)	Sales after LRT operation began (after 12/27/2008)



Locational Variables

- TOD Zoning (Dummy_TOD)
 - Value = 1 if parcel has TOD designation and sold after 11/19/2003 in Phoenix and 11/17/2005 in Tempe
- Distance to nearest station (Stdist_St)
- Distance to track (Stdist_Tr)
- Close to track dummy (Dummy_Tr)
 - Value = 1 if within 200 feet of track
- Distance to nearest CBD (Stdist_CBD)
- Distance to Airport (Stdist_Airport)



Interaction Terms

- Distance to nearest station *times* NEPA review phase dummy (Int_DSt_NEPA)
- Distance to nearest station *times* Project planning and design phase dummy (Int_DSt_PD)
- Distance to nearest station *times* Construction phase dummy (Int_DSt_Const)
- Distance to nearest station *times* Operation phase dummy (Int_DSt_Operat)

- Close to track dummy *times* NEPA review phase dummy (Int_DTr_NEPA)
- Close to track dummy *times* Project planning and design phase dummy (Int_DTr_PD)
- Close to track dummy *times* Construction phase dummy (Int_DTr_Const)
- Close to track dummy *times* Operation phase dummy (Int_DTr_Operat)

Exclusion of Outliers

Property type	Initial Sales Sample size	Criteria used to exclude outliers	Final sample size (N)
Single-family homes	90,580	Living_Sqft>300 & Living_Sqft<10,000 Lot_Sqft>=100 & Lot_Sqft<100,000 Bath_Fixt>=3 & Bath_Fixt<=20 Age_Bldg<=100 Floor<=3 Adjsaleprice_Livingsqft ^a >10 & Adjsaleprice_Livingsqft ^a <2,000	88,308
Condominiums	25,860	Living_Sqft>300 & Living_Sqft<6,000 Age_Bldg<=75 Adjsaleprice_Livingsqft ^a >10 & Adjsaleprice_Livingsqft ^a <2,000	25,652
Commercial parcels	6,013	Living_Sqft>300 & Living_Sqft<500,000 Lot_Sqft>200 & Lot_Sqft<500,000 Age_Bldg<=100 Adjsaleprice_Livingsqft ^a >10 & Adjsaleprice_Livingsqft ^a <2,000	5,521
Vacant parcels	2,022	Lot_Sqft>=50 & Lot_Sqft<500,000 Adjsaleprice_Lotsqft ^b >1 & Adjsaleprice_Lotsqft ^b <2,000	1,788



Single-Family Homes - Descriptives

Variable Name	N	Minimum	Maximum	Mean	Std. Deviation
Adj_Saleprice	88,308	4,043	1,790,146	71,025	46,168
Living_Sqft	88,308	322	8,514	1,421	521
Lot_Sqft	88,308	100	96,647	7,566	4,377
Age_Bldg	88,308	0	100	42	17
Patios	88,308	0.00	7.00	1.1868	0.92
Bath_Fixt	88,308	3.00	20.00	5.3606	1.97
Floor	88,308	1.00	3.00	1.0139	0.13
Dummy_Pool	88,308	0.00	1.00	0.1113	0.31
Dummy_PreNEPA	88,308	0.00	1.00	0.3888	0.49
Dummy_NEPA	88,308	0.00	1.00	0.2098	0.41
Dummy_PD	88,308	0.00	1.00	0.1297	0.34
Dummy_Const	88,308	0.00	1.00	0.1935	0.40
Dummy_Operat	88,308	0.00	1.00	0.0783	0.27
Dummy_TOD	88,308	0.00	1.00	0.0012	0.03
Stdist_St	88,308	96	12,104	6237	2724
Stdist_Tr	88,308	36	10,556	5939	2750
Dummy_Tr	88,308	0	1	0.0010	0.03
Stdist_CBD	88,308	576	38,757	18,315	8645
Stdist_Airport	88,308	4095	54,971	32,737	11,712

Condominiums - Descriptives

Variable Name	N	Minimum	Maximum	Mean	Std. Deviation
Adj_Saleprice	25,652	4,590	2,551,718	58,559	53,274
Living_Sqft	25,652	322	3,575	1,118	353
Age_Bldg	25,652	0.00	75	19.58	12.15
Patios	25,652	0.00	8.00	0.4608	0.56
Bath_Fixt	25,652	3.00	14.00	5.5353	1.91
Dummy_Pool	25,652	0.00	1.00	0.0027	0.05
Dummy_PreNEPA	25,652	0.00	1.00	0.2337	0.42
Dummy_NEPA	25,652	0.00	1.00	0.1769	0.38
Dummy_PD	25,652	0.00	1.00	0.1132	0.32
Dummy_Const	25,652	0.00	1.00	0.4071	0.49
Dummy_Operat	25,652	0.00	1.00	0.0692	0.25
Dummy_TOD	25,652	0.00	1.00	0.0050	0.07
Stdist_St	25,652	79	11,493	5,150	2,767
Stdist_Tr	25,652	32	10,553	4,731	2,855
Dummy_Tr	25,652	-	1.0000	0.0177	0.1300
Stdist_CBD	25,652	890	38,565	17,384	8,392
Stdist_Airport	25,652	6,829	54,904	33,830	10,647

Commercial Properties - Descriptives

Variable Name	N	Minimum	Maximum	Mean	Std. Deviation
Adj_Saleprice	5,521	8,897	28,050,665	610,672	1,414,906
Living_Sqft	5,521	321	484,556	14,959	31,440
Lot_Sqft	5,521	224	496,279	37,265	54,993
Age_Bldg	5,521	0	100	31.1311	18.59
Floor	5,521	1	4	1.0033	0.07
Dummy_PreNEPA	5,521	0	1	0.393	0.49
Dummy_NEPA	5,521	0	1	0.1998	0.4
Dummy_PD	5,521	0	1	0.1395	0.35
Dummy_Const	5,521	0	1	0.226	0.42
Dummy_Operat	5,521	0	1	0.0417	0.2
Dummy_TOD	5,521	0	1	0.0293	0.17
Stdist_St	5,521	88	11,493	5,636	3,098
Stdist_Tr	5,521	39	10,548	5,237	3,125
Dummy_Tr	5,521	-	1.0000	0.0272	0.1600
Stdist_CBD	5,521	372	38,055	14,378	7,383
Stdist_Airport	5,521	4,219	54,955	28,155	12,291

Vacant Parcels - Descriptives

Variable Name	N	Minimum	Maximum	Mean	Std. Deviation
Adj_Saleprice	1,788	1,247	11,870,933	173,220	537,626
Lot_Sqft	1,788	302	486,071	24,198	49,998
Dummy_PreNEPA	1,788	0.00	1.00	0.3697	0.48
Dummy_NEPA	1,788	0.00	1.00	0.1974	0.40
Dummy_PD	1,788	0.00	1.00	0.1504	0.36
Dummy_Const	1,788	0.00	1.00	0.2595	0.44
Dummy_Operat	1,788	0.00	1.00	0.0229	0.15
Dummy_TOD	1,788	0.00	1.00	0.0240	0.15
Stdist_St	1,788	104	11,420	5,134	2,923
Stdist_Tr	1,788	89	10,544	4,665	3,059
Dummy_Tr	1,788	-	1.0000	0.0308	0.1700
Stdist_CBD	1,788	521	38,641	11,217	7,207
Stdist_Airport	1,788	3,714	54,961	24,540	12,008